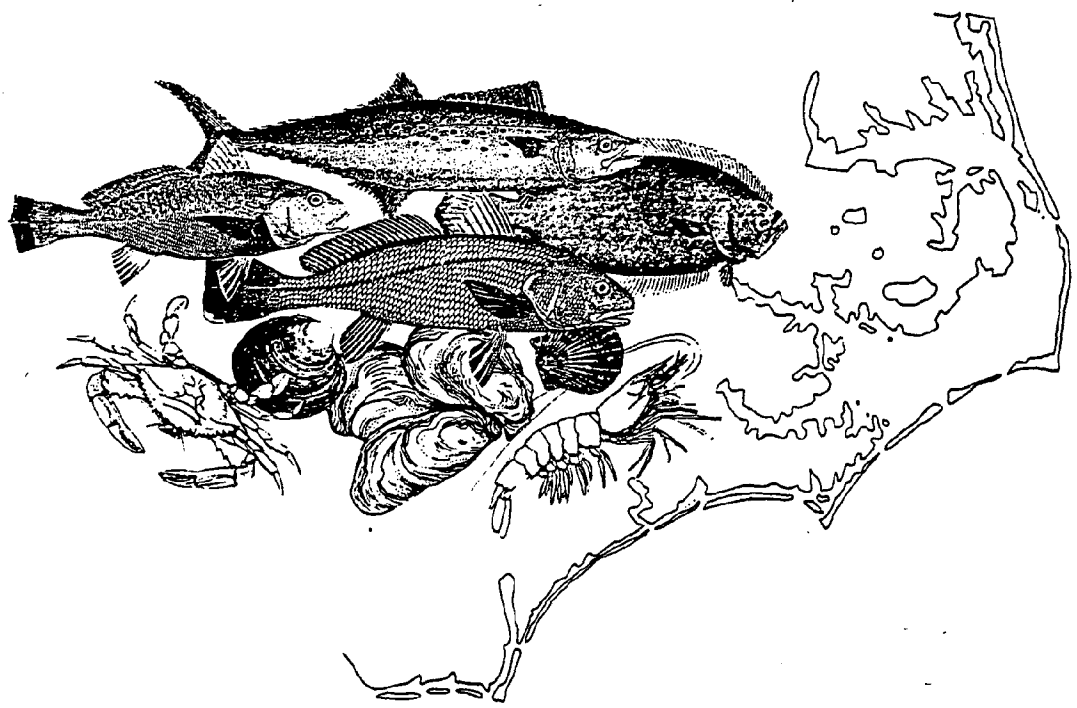
ROANOKE RIVER BASIN-ALBEMARLE SOUND

HISTORICAL STRIPED BASS PROJECT



North Carolina Department of Environment,
Health, and Natural Resources

Division of Marine Fisheries
Morehead City, NC 28557

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HISTORICAL STRIPED BASS PROJECT

by

Michael W. Street

North Carolina Department of Environment,
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Division of Marine Fisheries

Completion Report for Project F-36

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ABSTRACT

Dr. William W. Hassler, associates, and students conducted research and monitoring work on striped bass in Roanoke River and Albemarle Sound, North Carolina during 1955-1987. This 33-year data set is extremely valuable for evaluating the status and trends of the striped bass stock of the area. A total of 27 (mostly annual) reports summarized the work. Other reports were also written. All of the reports, as well as a small amount of raw data, were acquired and catalogued. A brief plan for computerizing the data was prepared.

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INTRODUCTION

The Albemarle Sound-Roanoke River (A-R) area supports North Carolina's major stock of striped bass. Along with the Chesapeake Bay striped bass stock, the A-R stock declined precipitously from the late 1970s through the 1980s. Enactment of the Emergency Striped Bass Study by the United States Congress in 1979 (PL 96-118) provided extra funds to North Carolina and other states to investigate causes for the decline. Lack of improvement spurred Congressional passage of the Atlantic Striped Bass Conservation Act in 1984 (PL 98-613), requiring states from North Carolina northward to adhere to an interstate fishery management plan for striped bass. This plan was prepared by the affected states' marine fisheries agencies and federal agencies under the auspices of the Atlantic States Marine Fisheries Commission. This Act was reauthorized by Congress in 1988 (PL 100-589), including an amendment requiring a three-year study of the A-R stock of striped bass. The Act was again reauthorized in 1991 (PL 102-130).

Prior to the above federal actions, research on striped bass had been conducted for many years in North Carolina, especially concerning the A-R stock. In connection with coastwide studies, Merriman (1941) tagged and released 600 stripers in eastern Albemarle Sound and on the ocean beach at Kitty Hawk during March and April, 1937. Vladykov and Wallace (1952) reported marking and releasing 477 striped bass in Currituck and Croatan sounds and six at Kitty Hawk in November, 1937. Merriman (1941) also tagged and released 506 stripers in western Albemarle Sound in April, 1938.

A record flood on Roanoke River in August, 1940 resulted in a call for a flood control reservoir; the John H. Kerr Dam was completed at river mile 179 in 1952. Hydroelectric power dams were completed later at river mile 145.5 (Gaston Dam, 1963) and at river mile 137 (Roanoke Rapids Dam, 1955).

A number of industries are located along the Roanoke River, using river water in manufacturing and discharging wastes into the river. Chief among these are pulp mills at Roanoke Rapids (began operation in 1909) and Plymouth (began operation in 1938). Towns along the river also utilize its waters for drinking and waste disposal.

The combination of dams and industrial/municipal pollution resulted, by the early 1950s, in major concerns over the health of the river and its fisheries resources. In connection with federal licensing of the Gaston Dam, a multiagency study was conducted under the guidance of the Steering Committee for Roanoke River Studies during 1955-58 and reported by Fish (1959). Work on striped bass was initially conducted by researchers at North Carolina State College (now North Carolina State University--NCSU), University of North Carolina-Institute for Fisheries Research, and the U.S. Bureau of Commercial Fisheries, Beaufort Laboratory. The University of North Carolina terminated work after 1958, and the federal government stopped by the mid-1960s.

Following the original studies during 1955-58, Dr. William W. Hassler of NCSU continued the striped bass studies, with support during various periods from Halifax Paper Co. (Hoerner-Waldorf Corp.), North Carolina Paper Co. (Weyerhaeuser Co.), U.S. Fish and Wildlife Service, and the North Carolina Division of Marine Fisheries (DMF). With help from a variety of graduate students and research assistants over the years, Dr. Hassler worked on A-R striped bass from 1955 through 1987, a total of 33 years. He retired from NCSU in 1983 but continued his work on a contract basis through 1987. Various aspects of the work have been continued by DMF and the North Carolina Wildlife Resources Commission (WRC).

This long-term record of striped bass data is extremely valuable in evaluating trends in the A-R stock and in the fisheries dependent on the stock. Such long-term records are rare in fisheries research, and they should be available for analysis by appropriate researchers.

Following the initial research during 1955-58, Dr. Hassler monitored specific aspects of striped bass life history, as follows:

1. Commercial harvest in Roanoke River;
2. Recreational harvest in Roanoke River;
3. Exploitation rate in Roanoke River and Albemarle Sound;
4. The number of eggs spawned in the upper river;
5. The viability of eggs spawned in the upper river;
6. The magnitude of the spawning population in Roanoke River;

7. Ecological conditions in the Albemarle Sound nursery area; and

8. Relative abundance of young-of-the-year (YOY) striped bass.

In addition, various short-term research projects related to striped bass have been conducted, such as a 7-year creel census in Albemarle Sound, striped bass age and growth, striped bass food habits, and development of sampling protocols for eggs and the sportfishing harvest in Roanoke River. A number of masters theses and one doctoral dissertation have resulted from the work of Dr. Hassler's students.

The specific objectives of this project were:

1. To acquire all of Dr. Hassler's historical data for striped bass and related studies in the Albemarle Sound-Roanoke River area during 1955-1987;

2. To organize and catalog the data; and

3. To prepare a report describing the data, including a brief plan for computerization of the data so it can be made available for analysis.

RESULTS

Data Acquisition

During 1989-90, DMF staff made several trips to Dr. Hassler's home in Raleigh, North Carolina to acquire striped bass information from Dr. Hassler. He provided approximately 50 cartons of materials (about 52 ft^3), including books, reports (published and unpublished), research notes, and data. Included were about two cartons of correspondence, reports, and data concerning the two pulp mills on the Roanoke River, representing studies conducted from the 1920s through the 1940s. Also included were dozens of reports on striped bass and many other topics, many of them duplicates, time series of several journals, and several cartons of books on general fisheries topics. This material will gradually be added to the DMF library in Morehead City.

Included in the collection were copies of all of Dr. Hassler's annual striped bass reports, including three co-authored with Dr. Bartholomew B. Brandt:

a summary covering 1955-58, and reports for 1959 and 1960. The 1960 report established the basic format for all future annual reports. All of the annual reports contain original data for the year covered, such as records of individual tagged and recaptured striped bass, individual egg samples, river stage data, and harvest data, as well as summary data for the current year and past years. This complete set of reports is extremely important because of the continuous record provided. Copies of the reports have been provided to the DMF Elizabeth City office, Dr. Roger Rulifson at East Carolina University, and the City of Virginia Beach.

Actual raw data included in the collection equals about one carton. In discussing the lack of original data with Dr. Hassler, he stated that he often discarded especially voluminous files of data sheets within a few years of collection, after the reports dependent on such data were completed. Dr. Hassler's storage space at NCSU was limited, and when he retired, he lost most of that space and had to discard most of the remaining data. It must be noted that virtually all of Dr. Hassler's work was conducted before the general availability of personal computers on which data are generally stored and analyzed today.

Annual Reports

There are a total of 27 annual reports concerning A-R striped bass, one report covering two years, and the 1955-58 summary noted above. In addition, Dr. Hassler produced in 1981 a summary report covering 1956-1980. He also prepared another report for the 1977-81 period. Both of these multi-year reports were prepared for DMF under a federal aid project. A complete listing of these reports is contained in Appendix I.

Work conducted during 1955-59 was largely experimental in nature, to develop appropriate methods, locate representative sampling areas, and determine seasonal variability. Beginning with the report for 1960, monitoring was emphasized.

The time series of data provided in the annual reports are shown by data type in Table 1.a. These data types are explained in Table 1.b. The only data type collected and reported in every report for every year (1955-1987) is the

Table 1a. Types of data included in annual Albemarle Sound-Roanoke River, NC striped bass reports, 1955-1987.

	Data types																
Year	A	B	C	D	E	F	G	H	I	J	K[1]	L	M	N	O	P	Q
1955													•			•	
1956	•	•	•	•									•			•	
1957	•	•	•	•									•			•	
1958	•	•	•	•									•			•	
1959	•	•	•	•					•	•	•	•	•			•	
1960	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1961	•	•	•	•			•	•	•	•	•	•	•			•	•
1962	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1963	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1964	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1965	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1966	•	•	•	•			•	•	•	•	•	•	•		•	•	•
1967	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1968	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1969	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1970	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1971	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1972	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1973	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•
1974	•	•	•	•	•[2]	•[2]	•	•	•	•	•	•	•		•	•	•
1975	•	•	•	•			•	•			•			•	•	•	•
1976	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•
1977	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•
1978	•	•	•	•			•	•		•	•		•		•	•	
1979	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•
1980	•	•	•	•			•	•		•			•	•	•	•	
1981	•	•	•	•			•	•		•	•	•	•	•	•	•	
1982	•	•	•	•			•	•		•	•	•	•	•	•	•	
1983	•	•	•	•			•	•		•	•	•	•		•	•	
1984	•	•	•	•			•	•		•	•	•	•		•	•	
1985	•	•	•	•			•	•			•		•		•	•	
1986	•	•	•	•			•	•			•		•		•	•	
1987	•		•	•			•	•			•		•		•	•	

1. Three methods were used to estimate spawning stock size, differing among the years; see Table 2.

2. Only during January-March.

Table 1b. Description of data types shown in Table 1a.

A.	Roanoke River commercial harvest in pounds and/or number of fish
B.	Roanoke River commercial harvest effort and/or catch-per-unit-effort (CPUE)
C.	Roanoke River recreational harvest in number of fish and/or pounds
D.	Roanoke River recreational harvest effort and/or CPUE
E.	Albemarle Sound recreational harvest in numbers of fish
F.	Albemarle Sound recreational harvest effort and/or CPUE
G.	Estimated number of striped bass eggs spawned in Roanoke River
H.	Estimated viability of striped bass eggs spawned in Roanoke River
I.	Detailed Roanoke River striped bass tagging/recapture data (length, weight, sex of individual fish)
J.	Summary of Roanoke River striped bass tagging/recapture data
K.	Estimate of annual Roanoke River striped bass spawning stock (three different methods used--see Table 2)
L.	Annual exploitation rate of striped bass
M.	Estimated relative abundance of young-of-year (YOY) striped bass in Albemarle Sound
N.	Length-weight data for individual YOY striped bass from Albemarle Sound
O.	Annual striped bass YOY data by date and station
P.	Summary striped bass YOY data
Q.	Roanoke River stage and/or temperature data associated with striped bass spawning

summary of relative abundance of young-of-year (YOY) striped bass from Albemarle Sound (data type P in Table 1.a). Detailed annual YOY data were collected annually and reported for every year except 1975 (data type M). The recreational catch and effort in Roanoke River were reported annually during 1956-1987 (data types C and D), as was the commercial catch in Roanoke River (data type A). Spawning data [estimated number of eggs (data type G), viability (data type H)] were reported annually during 1960-1987.

Detailed tag/recapture information (data type I) provides valuable data on size distribution and sex of Roanoke River striped bass. These data are somewhat variable because lengths were recorded in inches in some years and in metric units during other years.

The commercial harvest survey was intended to be a total census of the commercial striped bass catch in Roanoke River, including catch by gear and CPUE. In contrast, recreational data after 1968 were estimates based on a partial creel census designed by Liner (1968). Prior to that time, the creel census was conducted as a complete census. The North Carolina Wildlife Resources Commission (WRC) has continued the recreational creel census in Roanoke River, although a different method is used. Commercial fishing for striped bass in Roanoke River has become negligible because of regulatory changes. The recreational survey in Albemarle Sound (data types E and F) was an ambitious attempt to enumerate the catch and effort over a very large area for more than seven years. The WRC conducted a three-year survey in the Sound during 1977-79 (Mullis and Guier 1982). The DMF initiated a creel census in the Albemarle Sound area in 1990, based on the WRC design.

The estimates of egg number (data type G) varied widely over the years. Egg viability (data type H) was high (80% or more) during 1960-1974, declined during 1975-1980, and varied during 1981-1987.

The size of the spawning stock (data type K) was estimated by three different methods. The mark-recapture estimate was based on the simple Peterson (1896) method, and was discussed in the report for 1959. The catch-per-unit effort population estimate depended on collection of detailed catch and effort data for the sport and commercial striped bass fisheries of Roanoke River. This

method was based on Fredin's (1954) work on American shad in the Connecticut River. The 1969 report contains the best discussion of this method. The third procedure involved simply dividing the total harvest (recreational and commercial combined) in Roanoke River by the annual (or cumulative in most years) exploitation rate in the River, as derived from mark-recapture data. All three methods were not utilized in any one year (Table 2). The mark-recapture and catch-per-effort procedures were jointly utilized in 1960 and 1962, and were calculated for 1956-1959 (see 1960 report, p. 28). The 1956 and 1958 estimates by the two methods are quite different, while the 1957, 1959, and 1960 estimates are similar, especially those for 1959 and 1960. In 1962, the estimates from the two methods are identical, but the catch-per-effort method began with the population estimate from the mark-recapture calculation, so it was not calculated independently.

The catch-per-effort and exploitation-rate methods were both used in 1970, and the estimates were quite close. For some unexplained reason, the value derived from the catch-per-effort procedure was selected for inclusion in the cumulative table of that year's report even though the exploitation-rate method was used for the remainder of the time series. However, because all data needed for any of the three methods are included in the reports, population estimates can be recalculated by the exploitation-rate method and the catch-per-effort method for the entire time series, and for the mark-recapture method for all years in which fish were tagged (1956-1974, 1976-1984).

The relative abundance of YOY striped bass in Albemarle Sound (data type M) is an extremely important statistic. These annual values are considered to be the best indicator of annual reproductive success. The DMF began YOY sampling along with Dr. Hassler's staff in 1976 in order to calibrate DMF gear with Dr. Hassler's. Sampling for YOY stripers has been continued by DMF using gear and methods identical to those used by Dr. Hassler. Other data on YOY in the reports include length and weight data for 1975-1977 and 1979-1982.

Various other types of data were recorded in the reports, generally for periods of one or two years. Such data include ages of adults tagged in Roanoke River (1959, 1960), Roanoke River flow (1957-1959), food habits (1970), and environmental data associated with YOY sampling in Albemarle Sound (1986-87).

Table 2. Three methods used to estimate the spawning stock of striped bass.

Year	Mark-recapture	Exploitation rate	Catch-per-effort
1959	•		
1960	•		•
1961			•
1962	•		•
1963		•	
1964		•	
1965		•	
1966		•	
1967			•
1968			•
1969			•
1970		•	•
1971		•	
1972		•	
1973		•[1]	
1974		•[1]	
1975		•[1]	
1976		•	
1977		•[1]	
1978		•[1]	
1979		•[1]	
1980			
1981		•[1]	
1982		•[1]	
1983		•[1]	
1984		•[1]	
1985		•[1]	
1986		•[1]	
1987		•[1]	

1. Used long-term rather than annual exploitation rate.

Dr. Hassler also produced a number of additional unpublished reports at various times, covering topics such as fish distribution in the delta of the Roanoke River, trends in A-R striped bass abundance, and effects of pollution on fishes. He and his graduate students also published several papers based on the A-R work. In addition, several students produced masters theses and one doctoral dissertation in connection with the A-R studies. A list of the publications, unpublished reports, theses, and dissertation is provided in Appendix II.

Other Data

Among the many boxes of material acquired from Dr. Hassler were 36 items of data specifically associated with striped bass in Roanoke River during 1955-1987. Some of the material is from sources other than Dr. Hassler's work, but these items are included because they concern the A-R area and striped bass during the time period of Dr. Hassler's work. The items are discussed individually below, in approximate chronological order. All of the materials discussed are stored at the DMF office in Morehead City, NC.

1. Turbidity data are included for various months and years during January, 1938 through December, 1957. Most data are monthly, but some are daily. Also included are daily water temperatures for March-May, 1950-57. Data are for Roanoke River at Roanoke Rapids. Monthly maxima and minima for dissolved oxygen and pH are included for 1938-39.

2. This item includes Roanoke River discharge data for Scotland Neck (October, 1947-September, 1950) and Roanoke Rapids (October, 1947-September, 1957).

3. Roanoke River stage hydrographs for March-May, 1953-1958 comprise this item.

4. This data set includes dissolved oxygen (DO) and wind direction data for Roanoke River near Plymouth, as well as a few samples from Albemarle Sound during August, 1953-December, 1956. Some DO data for March-December, 1956 are daily (Monday-Friday).

5. Several types of water chemistry and other data are included in this material, covering April, 1954-January 1958: river discharge, temperature, DO, biological oxygen demand (BOD), pH, alkalinity, ether, and sulphides. The data are from Roanoke River, principally at Roanoke Rapids.

6. Monthly turbidity data for 1942-1951 and 1951-57 at Roanoke Rapids are listed, summarized, and graphed to show differences in pre- and post-impoundment (Kerr Dam) situations.

7. This item is a single sheet including data from five samples in Albemarle Sound (3) and Roanoke River (2) during 30-31 August 1955. Both of the river samples were taken with rotenone; one Sound sample was taken with a seine; and the other two samples from the Sound were collected by a trawl. Data include identification, number, and length range of fish species.

8. Thirty samples are included in this data set, one with a trawl, two with a seine, and 27 plankton net samples, all taken during June, 1955. Nine of the samples were taken in western Albemarle Sound, and the rest are from Roanoke River, from the mouth upstream to Weldon.

9. This item is probably an appendix to a report to the Roanoke River Steering Committee. Included is a summary of sampling during 1956 for striped bass eggs and larvae in Roanoke River (30 March-26 May), two plankton samples from Albemarle Sound (26 May), and YOY trawl samples from Albemarle Sound (26 June-5 September). Length ranges are provided for YOY stripers. There are also records of egg and larval samples from Tar, Neuse, Cape Fear, Black, and Cashie rivers.

10. This data set includes daily turbidity data for January, 1955-November, 1957 from the Roanoke River at Plymouth.

11. Included in this item are DO, water temperature, and (some) chloride data from extreme western Albemarle Sound and lower Roanoke River (up to mile marker 13) during July, August, and October, 1957.

12. This item encompasses a large amount of data for 1957, collectively called the "Roanoke Delta Study." Summaries of the data are included in the 1955-58 summary report. Included with these data are a number of miscellaneous notes and correspondence, as well as egg and larval sampling data for Cape Fear, Chowan, Meherrin, and Tar rivers. The following A-R data are included:

    Roanoke River--88 egg samples during May;

    Roanoke River delta--148 plankton net samples in May and 39 in June; 161 fyke net and six gill net samples, March-June;

    Roanoke River delta and western Albemarle Sound--93 trawl samples, June-October;

    Western Albemarle Sound--three seine samples, July.

Data include date, location, time, water temperature, a list of species collected, numbers of each, and size ranges.

13. Included in this set of information are Roanoke River discharge data for October, 1958-September, 1978, a period of 20 years. The location is Roanoke Rapids.

14. This item consists of a single data sheet for a trawl sample taken on 4 April 1959 at Jamesville on Roanoke River.

15. This collection consists of daily data sheets and attached notes on the harvest of the Jamesville haul seine on Roanoke River during 18 March-7 May 1959. Data on tagging of striped bass are included. These data are presented in Appendix Table 3 of the 1959 report.

16. Mark and release records for 545 striped bass tagged during 14 April-4 May 1959 on Roanoke River at Williamston and Jamesville are

included in this item. Recapture data are found in Appendix Table 1 of the 1959 report. Sex, weight, and fork length for each fish are included.

17. This item consists of a 1960 report by an undergraduate zoology student entitled "An Age and Growth Analysis of Roccus saxatilis (Walbaum) in Roanoke River, N.C." as well as data sheets for ageing 828 striped bass. Scale focus-to-annuli measurements are included. A copy of the actual data is included in the 1959 report as Appendix Table 2.

18. Included in this item are data (stage, age) on collections of striped bass eggs from several locations along Roanoke River during May, 1959. Some of the data are included among several tables in the 1959 report. This information was part of MS thesis work by James T. Brown (see Hassler et al. 1981).

19. This item includes data and analyses of striped bass egg age and river stage from Roanoke River samples at Palmyra during May, 1960. This collection was also part of the MS thesis work of James T. Brown.

20. Included in this item are data and analysis concerning viability of striped bass eggs from Roanoke River in 1960.

21. Striped bass egg sampling data and analysis for Roanoke River comprise this data set. The year of sampling is probably 1960 because the estimate of total egg number (737.5 million) is close to the estimate for 1960 (740 million) shown in the annual report.

22. This item includes a variety of striped bass YOY data, data summaries, and analyses. Raw data include length and weight for 1962 and 1965. Data for 1975 are grouped in 5 mm length classes. Also included are annual condition factors for some years not included in Trent's (1962) MS thesis (1962, 1965, 1975, 1976).

23. This item includes bihourly Roanoke River gage heights at Weldon during April and May, 1964.

24. Written descriptions of the recreation fishery creel census sites of the Albemarle Sound area during 1976-1974 make up this item.

25. Included in this item are original data sheets, summaries, and creel census cards for the 1971 Albemarle Sound creel survey.

26. Water chemistry data for Welch Creek (Roanoke River tributary which received effluent from the Weyerhaeuser Co. pulp mill at Plymouth) during September, 1976-October, 1977 comprise this collection. Data types include pH, DO, water temperature, BOD, chemical oxygen demand, and nitrogen (total Kjeldahl?).

27. This item contains detailed Roanoke River striped bass tagging and recapture data for 1976. Data include tag number, sex, tagging and recapture dates, tagging and recapture locations, tagging and recapture gears, and length and weight when tagged.

28. This item includes detailed Roanoke River striped bass tagging and recapture data for 1977. Data types are the same as for 1976.

29. This item is the same as the previous two items, but for 1978.

30. Detailed Roanoke River striped bass tagging and recapture data for 1979 comprise this set of data.

31. This item includes detailed Roanoke River striped bass tagging and recapture data for 1980.

32. Detailed Roanoke River striped bass tagging and recovery data for 1981 make up this data set.

33. This set of data includes detailed Roanoke River striped bass tagging and recapture information for 1982.

34. Detailed Roanoke River striped bass tagging and recovery data for 1983 make up this item.

NOTE: Items 27 and 28 are included in the reports for those years. Items 29-34 are not included in the reports for 1978-1983.

35. Scale samples (23) from Roanoke River striped bass during April, 1982 comprise this data set. Date, length, sex, and weight are included for each sample.

36. This item consists of a single tag recovery record for a striped bass tagged in 1984 and recaptured in 1986.

DISCUSSION

Probably the most important items of the 36 described above are the tag-recapture records for 1978-1983 and the tagging data for 1959, especially the length, weight, and sex data. The "Roanoke Delta Study" data may also be of significance. The age data from 1960 should be of use in comparison to more recent data.

In the "annual" report for 1982-83 (p. 63-66), there is a discussion of the possible relationships between a variety of environmental factors and (1) viability of striped bass eggs and (2) abundance of striped bass YOY. Extensive statistical analyses were conducted between these two data sets and environmental variables. Easterly (E, NE, SE) and southerly winds (S, SW, SE) mean velocity, direction, and peak velocity were not correlated with YOY abundance. Neither peak spawning dates nor spawning season duration were correlated with abundance of YOY. There were no significant relationships between spawning stock size, egg abundance, Roanoke River sport catch, or Roanoke River commercial harvest and striped bass YOY abundance. Neither were commercial landings of striped bass 1, 2, 3, or 4 years later related to the abundance of YOY stripers. Roanoke River discharge during May was related to YOY abundance: low to moderate discharge was favorable, while high flow was not.

COMPUTERIZATION PLAN

Objective: To make Dr. Hassler's Albemarle-Roanoke striped bass data available in a computerized format for analysis by appropriate investigators.

Strategy: Computerization of the A-R striped bass should be conducted in three steps:

1. A person knowledgeable about striped bass life history and competent in statistical analysis and computer operations should review the data in detail. The appropriate input formats would be developed and the data organized for input. To test the validity of the formats, several small data sets should be chosen, coded, key-entered, and retrieved in formats suitable for analysis. Written documentation of the database and process should be prepared. About 3-4 months will be required to accomplish this task.

2. Using procedures and formats developed in Task 1, a data clerk would code the data on data entry forms. This task would also take 3-4 months.

3. The final task would be to actually enter the data into a computer and database. A data clerk would need about 3-4 months to complete the work.

ACKNOWLEDGEMENTS

Dr. William W. Hassler is owed a great debt by all those concerned for the health of Albemarle-Roanoke striped bass for his perseverance in continuing to monitor the stock over the years. I thank Paul Phalen of DMF for his assistance in acquiring Dr. Hassler's material and for separating the striped bass information from other items in the collection. I am also grateful to Christie Guthrie and Diana Willis for typing this report.

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A. Annual reports on Albemarle-Roanoke striped bass studies

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